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Exploring the Effect of Green Element on Condominium Price in Penang

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Abstract

The emphasis of this research is exploring the green element effect on the price of residential properties. This research identified the prices difference between GBI and non-GBI residential, further demonstrates the relationship between price and green by utilizing Multiple Regression Analysis. The samples are 471 condominiums in Penang derived from the database of NAPIC. The empirical result of the research shows that a residential building having GBI certification increased the property price by RM1009.079. Findings of this research contribute to the significant relationship between green element and condominium price, as well as indicate the impacts of GBI on the price of properties in Malaysia.

Keywords: green, GBI, condominium, regression

1.0 Introduction

To increase the quality of life is a vast challenge in built environment. In this context, the sustainability has been crucial in developed countries. The growth of this area lead to more researches and studies, and one of the barriers in implementing this concept is a low level of awareness and knowledge (Mohamad Bohari, Skitmore, Xia, & Zhang, 2016). The benefit of going green and sustainable are tremendously discussed regardless of RICS (2005) has also associated green building benefits in economic context for the occurrence of higher rents and asset value.

In Malaysia, the PAM Council introduced the Green Building Index (GBI) in February 2009 for certification and accreditation of green building. The establishment of GBI is to encourage sustainable and increase awareness among property players. In view of the above, this research is aimed to determine the effect of GBI, the green element on the property market.

Because of growing interest in green building development, previous research was done to prove the benefit of going green in the economic context. The economics of green building are being argued, and an amount of studies in real estate have endeavoured to answer the question increase. Many researches reveal the significance result especially in a matured market like United States, Australia and the United Kingdom. However, little study has been done on the property market in Malaysia as it is an emerging market for green building.

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2.0 Literature Review

2.1 Factors affecting value

When assessing the value of property, the price is used to determine the market value, as market value was defined as 'estimated amount of which the property should exchange…'. The micro and macro factors may affect the property value, as the value of a house can be influenced by property-specific factors and market-related factors (Wyatt, 2007). Wyatt further explained property-specific factors as the main physical characteristics of the property such as size, age, condition, quality, appearance, legal and location while the market-related factors were referring to the property market.

Studies done by Oloke, Simon, & Adesulu (2013) explained that neighbourhood factors affecting residential property value revealed that the level of infrastructure development is the most important neighbourhood factor influencing property values followed by estate plan and quality designs while ethnic mix and owners/renters mix has less influence on property values as compared to others in this category. Further, in previous studies (Thamrongsrisook, 2011) it was found that public facility within the area indeed affects prices of the condominium.

Lin & Hwang (2004) as compared to a unit located on the lower floors of the condominium. However, another researcher (Oloke et al., 2013) highlighted the number and size of bedrooms in a residential property is the most important factor affecting its value followed by the number of toilets and bathroom as well as the size of land and building. However, availability of swimming pool and fireplace are less significant on residential property value in this study area.

The location is another factor that marks the attention in most previous researches. As noted by Rosen (1974), the land value does not only depend on the physical characteristics of a building but also the environment surrounds the building, for example, developments of various transportation modes have great significant to physical and economic developments. Miller, Spivey, & Florance (2007) then introduced the following three variables for the study of the environment; views of public parks or gardens, the property to the closest green area and the size of the green area.

Jayantha & Man (2013)described the price of a house is a function of structural, environmental and locational attributes. To understand property market, hedonic regression analysis has been applied in most of the researches. Some designed to understand the locational factors that may influence the price (Monson, 2009)(Kiel & Zabel, 2008)(Thériault, Des Rosiers, Villeneuve, & Kestens, 2003). Others can be the amenities attributes such as rail station and infrastructure (Lorenz & Lützkendorf, 2008)(Kilpatrick, Throupe, Carruthers, & Krause, 2007)(Nazir, Othman, & Nawawi, 2015).

Based on the ideas of few researches, structural attributes are size of building /floor, stories of building and age (Miller, Spivey, & Florance, 2007; Aroul, 2009; 2011; Addae-Dapaah & Chieh, 2011; Jayantha & Man, 2013;Yang, 2013; Jaques et al., 2015). Another attributes that are mostly used are location and neighbourhood for instance, view and facilities (Fuerst & McAllister, 2011; Addae-Dapaah & Chieh, 2011; Yoshida & Sugiura, 2010) and time attributes such as year of transaction price takes place (Fuerst & McAllister, 2011; Addae-Dapaah & Chieh, 2011; Aroul, 2009; Jaques, Jaques, Norman, & Page, 2015).

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2.2 Green as a factor in determining the property price

The initial effect of green has been established by Langdon (2007)specific towards construction cost, occupancy rate and capital value. But studies did towards the effect of having a green element in commercial building resulted not much different in sales price in Malaysia as green building is new in the market (Halim, 2009). Is different in matured market, such green building increase in their selling price and rent in both sector residential and commercial in a range of 3% to 11% (Aroul, 2009)(Appraisal Practices Board, 2015)(Cerqual, 2012)

All the above studies discussed to anticipate the price effect, the marginal price effect of a single characteristic (property factor) and aggregate market outcomes in a partial equilibrium framework can be demonstrated. Recent interest in green building studies leads to research on the impact of green certification or labelling or green features (Addae-Dapaah & Chieh, 2011)(Aroul & Hansz, 2012)(Jayantha & Man, 2013(Yang, 2013)(Appraisal Practices Board, 2015). Thus, to understand the market of green building, the green attributes should be imperative in determining the value.

2.3 Green Building Index in Malaysia

The GBI program was developed to support the national agenda, the National Green Technology Policy (NGTP) in 2009. It is intended to promote green building, sustainability and raise awareness within the construction and market industries. As of March 2016, GBI has certified about 150 million square feet building inclusive of commercial, residential, retail, industrial, hotel and resort, and hospital properties. GBI rating tool has established six criteria in assessing the greenness of building, hence, referred as a green element in this research as tabulated in Table 1. There are four classifications of rating by GBI, platinum, gold, silver and certified. The rating will be awarded according to the points scored.

Table 1. GBI Assessment Criteria

Criteria – Green element	Maximum point
Energy efficiency (EE)	35
Indoor environment quality (EQ)	21
Sustainable site planning and management (SM)	16
Material and resources (MR)	11
Water efficiency (WE)	10
Innovation (IN)	7

Source : GBI

3.0 Research Area and Methodology

The data utilized for this research is categorized as secondary data, sale transaction price of an open market from a database of National Property Information Centre (NAPIC), Penang. Located at the northern of Peninsular Malaysia, Penang is one of among developed states in Malaysia, with the total population of 1.89 million populations.

The state was chosen because quite of a number of green buildings were built and there are few GBI certified residential scheme. The choice of condominiums for the study involves selection using the area cluster sampling, which are condominiums in District of Timur Laut. Within this district, two sub-areas were chosen which consist of both GBI and non-GBI condominiums. The information on a green residential building was collected from Green Building Index website. There are The Light Linear, The Light Point, The Light Collection I, II and III was selected as the scheme with the green element, whereas The Spring, Ocean View, Summer Place, Bayswater, Platino, Vertiq and Pearl Regency were selected as non-green scheme. The reason for choosing these areas was their similar locality and distance to central business district, as well as similar access to the Jelutong Expressway. This may refute the effect of location and neighbourhood facilities, along with transportation facilities. These entire condominiums schemes have identical facilities such as swimming pool, gymnasium, security, covered car park, multi-purpose hall, BBQ area and other facilities. The list of variables and their expected signs are tabulated in Table 2.

In analyzing and evaluating the results of this research, quantitative approaches were used involving data and information analyzed by using the regression analysis, which has been functioning to explore the effect of property attributes, and the relationship among one another (BožiĆ, Dragana Mili ĆEVIĆ, PejiĆ, & Marošan, 2013).

Table 2. The Variables and expected relationship with price

Variable	Characteristic	Code	Definition	Expected sign
Dependent variable	Price per square metre	PRICE	Transaction price of condominium (RM/unit)	Nil
Structural Attributes	Floor area (sq. m)	FAREA	Floor area of unit in square metre	+ve
	Floor level	FLEVEL	Floor level of unit	+ve
	No of Rooms	ROOMS	Number of bedrooms	+ve
	Age of building	AGE	From completion date until 2016	-ve
	Tenure	TENURE	1 if freehold, 0 if leasehold	+ve
Locational attributes	Sea View	VIEW	1 if the unit has sea view, 0 if otherwise	+ve
Time Attributes	Year of transaction	YEAR	Year of the date of transaction	+ve
Environment attributes	GBI certified	GREEN	1 if the unit is GBI, 0 if non-GBI residential	+ve

This research seeks to examine the relationship between the green variable and residential price; the selected sale data consist of 471 sales of individual condominium units, which recorded from the year 2011 to 2016. This transaction period was specifically chosen because the first sale of the green residential building was in 2012. The dependent variable is the sales transaction price analyzed per square metre, while independent variables are divided into four main categories of property attributes known as structural attributes, locational attributes, time attributes and environment attributes (Crompton, 2001)(Kamali, Hojjat, & Rajabi, 2004). The data of transaction price, floor area, floor level, the number of bedrooms, tenure, and date of the transaction were obtained from NAPIC. The information on the age of building and view were obtained from Propwall and Google Maps websites.

4.0 Result and Discussion

This section discusses the empirical results provided from various statistical tools utilized such as descriptive statistics, Pearson's correlation test, adjusted R^2, ANOVA analysis, and linear regression analysis. The sample of condominium properties consists of small to large unit size are presented in Table 3 with a range of price per unit between RM230,000 and RM3,350,000 and price per square metre between RM2,018 and RM14,059 with a standard deviation of RM 350,475.233 and RM1,763.553 respectively. Further, the descriptive analysis results indicate the floor area of the sampled condominiums were in the range of 81 to 318 square metres. With that range of size, the per unit price of a condominium was RM6,873.53.

Table 3. Summary of Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Price	471	230000	3350000	1015980.03	350475.233
Price Per Sq M	471	2018	14059	6873.53	1763.553
Floor area	471	81.00	318.00	148.6310	35.23319
Floor Level	471	1	34	12.03	7.129
No of Bedrooms	471	1	4	3.06	.508
Age of building	470	1	12	4.84	2.493
Tenure	471	0	1	.98	.129
View	471	0	1	.79	.406
Year of Transaction	471	2011	2016	2013.33	1.508
GBI certified	471	0	1	.51	.500

4.1 Correlation analysis

To determine the significant effect of the green variable in the study area, analysis has been made by using regression coefficient analysis. Before the analysis can be performed, there are three assumptions should be met; the sum of independent, identically normally distributed and constant variance; there is a linear relationship between dependent and independent variables and the independent variables must not be highly correlated. The correlation matrix in Table 4 demonstrates the correlation between independent variables and results show that independent variables do not highly correlate with each other. The correlation coefficient r of each independent variables are less than 0.91 or -0.91, the indicator of strength correlation (Chua, 2012). This also indicates that multicollinearity does not exist. Multicollinearity exists when independent variables are highly correlated with r> .9 (Pallant, 2010).

The further test could be done using VIF value and the tolerance value. Table 5 shows all tolerance values are more than 0.10 which indicates multicollinearity assumption is not violated and supported by the variance inflation factor -VIF values for all variables less than 10.

Table 4. Correlation analysis

		Price Per Sq M	Floor area	Floor Level	No of Bedrooms	Age of building	Tenure	View	Year of Transaction	GBI certified
Price Per Sq M	Pearson Correlation	1	-.091*	-.064	-.139**	-.429**	.181**	.383**	.610**	.391**
	Sig. (2-tailed)		.048	.167	.003	.000	.000	.000	.000	.000
	N	471	471	471	471	470	471	471	471	471
Floor area	Pearson Correlation	-.091*	1	-.152**	.053	.097*	.185**	-.622**	-.228**	-.047
	Sig. (2-tailed)	.048		.001	.254	.035	.000	.000	.000	.304
	N	471	471	471	471	470	471	471	471	471
Floor Level	Pearson Correlation	-.064	-.152**	1	.170**	.003	.074	.038	.016	-.419**
	Sig. (2-tailed)	.167	.001		.000	.946	.107	.405	.730	.000
	N	471	471	471	471	470	471	471	471	471
No of Bedrooms	Pearson Correlation	-.139**	.053	.170**	1	.210**	.015	.037	-.161**	-.049
	Sig. (2-tailed)	.003	.254	.000		.000	.748	.420	.000	.292
	N	471	471	471	471	470	471	471	471	471
Age of building	Pearson Correlation	-.429**	.097*	.003	.210**	1	-.206**	-.251**	-.552**	-.453**
	Sig. (2-tailed)	.000	.035	.946	.000		.000	.000	.000	.000
	N	470	470	470	470	470	470	470	470	470
Tenure	Pearson Correlation	.181**	.185**	.074	.015	-.206**	1	.095*	.084	.135**
	Sig. (2-tailed)	.000	.000	.107	.748	.000		.040	.070	.003
	N	471	471	471	471	470	471	471	471	471
Sea view	Pearson Correlation	.383**	-.622**	.038	.037	-.251**	.095*	1	.343**	.472**
	Sig. (2-tailed)	.000	.000	.405	.420	.000	.040		.000	.000
	N	471	471	471	471	470	471	471	471	471
Year of Transaction	Pearson Correlation	.610**	-.228**	.016	-.161**	-.552**	.084	.343**	1	.168**
	Sig. (2-tailed)	.000	.000	.730	.000	.000	.070	.000		.000
	N	471	471	471	471	470	471	471	471	471
GBI certified	Pearson Correlation	.391**	-.047	-.419**	-.049	-.453**	.135**	.472**	.168**	1
	Sig. (2-tailed)	.000	.304	.000	.292	.000	.003	.000	.000	
	N	471	471	471	471	470	471	471	471	471

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 5. Tolerance and VIF value

Model		t	Sig.	Collinearity Statistics	
				Tolerance	VIF
1	(Constant)	-12.663	.000		
	Floor area	3.090	.002	.472	2.117
	Floor Level	1.462	.144	.665	1.504
	No of Bedrooms	-1.976	.049	.889	1.125
	Age of building	1.016	.310	.477	2.096
	Tenure	1.745	.082	.850	1.177
	Sea view	3.005	.003	.340	2.939
	Year of Transaction	12.717	.000	.596	1.677
	GBI certified	4.831	.000	.387	2.583

Figure 1 (a) represents the normal probability plot that the residuals are normally distributed. There is random pattern in scatter plot (figure 1b) which indicates the residuals have constant variance, independent of each other and linearly related. Based on the above test and result, all regression assumption has been satisfied, and further analysis using multiple regression analysis can be done.

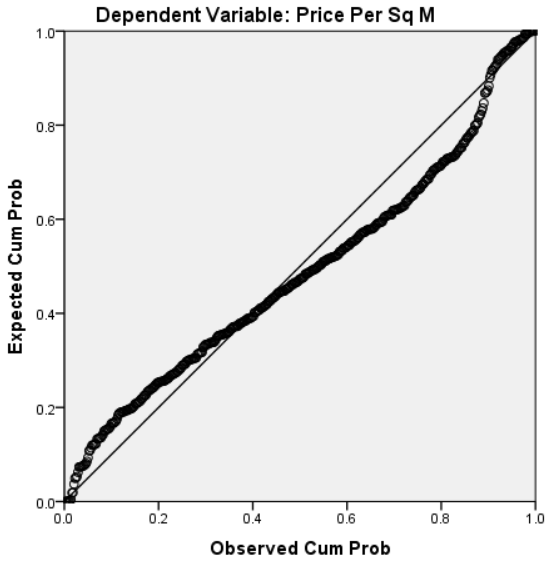

Fig. 1: Scatterplot of data

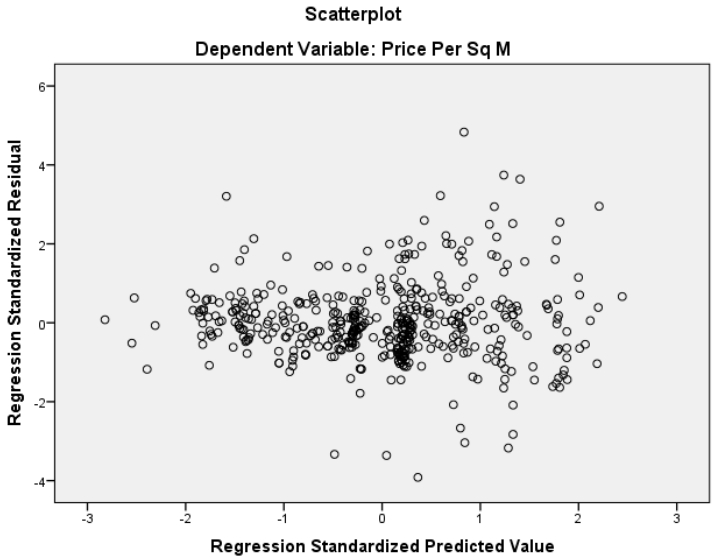

Fig. 1. (b) Scatterplot of data

4.2 Regression analysis and result

Based on the results in Table 6, the model explains the R^2 of 0.484 or 48.4% of the variation in the property price of the study area which can be explained by the selected independent variables (predictors). Further, the *F*-value of 54.114 also indicates that the model significantly explains the variation of condominium price and the *p*-value is 0.000 which lower than 0.05. The variation in condominium price was explained by the selected independent variables.

Table 6. The result of R^2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.696[a]	.484	.475	1275.964

a. Predictors: (Constant), GBI certified, No of Bedrooms, Floor area, Tenure, Year of Transaction, Floor Level, Age of building, Sea view
b. Dependent Variable: Price Per Sq M

Table 7. ANOVA result

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	704817750.925	8	88102218.866	54.114	.000[b]
	Residual	750546962.736	461	1628084.518		
	Total	1455364713.662	469			

a. Dependent Variable: Price Per Sq M

b. Predictors: (Constant), GBI certified, No of Bedrooms, Floor area, Tenure, Year of Transaction, Floor Level, Age of building, Sea view

From the regression result, not all independent variables in log-linear have significant effects on the price per unit per square metre of a condominium in Penang. Based on the results in Table 8, there are five variables showing the significant effect floor area, a number of bedrooms, sea view, year of transaction and GBI certified. The objective of this research is to identify the relationship between green and price of residential properties. The green element is found to be positive coefficient with *t*-value of 4.831 and *p*-value is 0.000. Further, the model with a coefficient value of 914.079 for GBI certified variable explains the variance of RM914.079 in the condominium price to have green elements. Subsequently, property buyers are willing to pay 26% higher for a green residential which certified by GBI.

The other variables, floor level, the age of building and tenure, analysis results show that it is not significant with the *p*-value more than 0.05. Buyers in Penang are said to be their affordability level in purchasing a house are higher. As Penang Island is relatively small in area, limited space for development, high-rise building became famous and notorious. Therefore, the structural attributes; floor area and a number of rooms, as well as sea view attributes may affect the price of a condominium. In fact, the geographical state of the island that is surrounded by the sea caused them to overlook the attributes to buy a house. This explains why people look for other quality of living by paying more for the environment-friendly property.

Table 8. The summary of regression model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1291453.853	101984.958		-12.663	.000
	Floor area	7.509	2.430	.150	3.090	.002
	Floor Level	14.815	10.132	.060	1.462	.144
	No of Bedrooms	-246.996	124.994	-.070	-1.976	.049
	Age of building	34.748	34.216	.049	1.016	.310
	Tenure	860.990	493.539	.063	1.745	.082
	Sea view	746.292	248.364	.172	3.005	.003
	Year of Transaction	643.567	50.605	.551	12.717	.000
	GBI certified	914.079	189.208	.260	4.831	.000

5.0 Conclusion

This research sets out to determine the effect of the green element on the residential property price. The empirical result of the research suggests that a residential building having GBI certification can increase the property price by RM1009.079. The study used condominiums as a case study located in Penang state, Malaysia. It is concluded that the condominium price in Penang is relatively higher if it is certified as green. Furthermore, other variables that expected to have a positive relation such as sea view and floor area with the price are not significant, resulted in a lesser effect of variables on residential price in Penang.

It seems that green element can be regarded as a selling point for developers. The green certification properties tend to have a better selling price in the residential market. Thus, not only have a better value of a property but also have a better quality of life. Hence, more property players will venture into sustainable development. It would be intriguing to measure the effect of green. The findings of this research prompt the important implications of having a green building and the ability of the market to exploit the environmental in investment decisions. Although the costs of sustainable are relatively high from conventional building, for long term benefit, developers can promote sustainability by venturing into it.

The research has produced findings which are beneficial for enhancement of literature review on green building impact. However, it is limited in a few aspects which should be well-addressed in the future. Further research can be conducted with more samples and using variables which may be neglected in this research.

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